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(71) Applicant
General Motors Corporation

(Incorporated in the USA - Delaware)

3044 West Grand Boulevard, Detroit, Michigan 48202, United States of America

(72) Inventors
David Edward Compeau
Mark Manuel
Lloyd Walker Rogers

(74) Agent and/or Address for Service
M J Denton
Patent Section (F6), Vauxhall Motors Ltd, PO Box 3, Kimpton Road, Luton, Bedfordshire, LU2 0SY, United Kingdom

(54) Actuator mechanism for a closure latch

(57) An actuating means for a closure latch (10) includes a driver or passenger controlled electric motor driving a reciprocable rack (130) through a gear train. The rack is resiliently biased (146) to a neutral position and shifts an actuator (150) from neutral to an operating position when the rack is moved from the neutral position to a driving position. The actuator is engageable with a latch operator (62) to control movement of the latch bolt (32) to unlatched position when the actuator moves to an operating position. When the actuator reaches the operating position, the actuator is positively stopped to stall the electric motor or power operator. When the power is removed from the stalled electric motor or power operator by the driver or passenger releasing a switch, the bias of the resilient centring means returns the rack to its initial neutral or starting position and back drives the electric motor through the gear train.

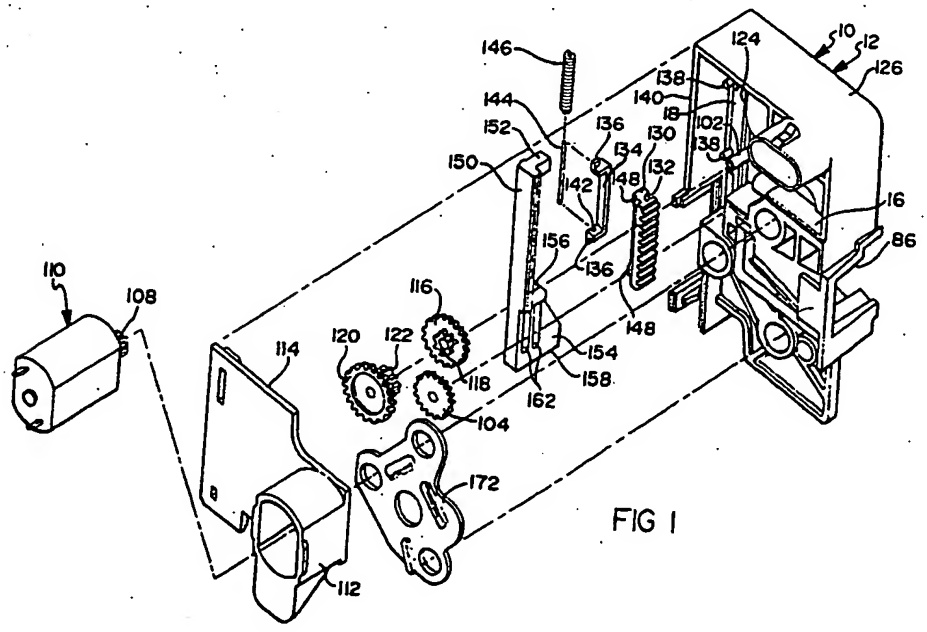

FIG 1

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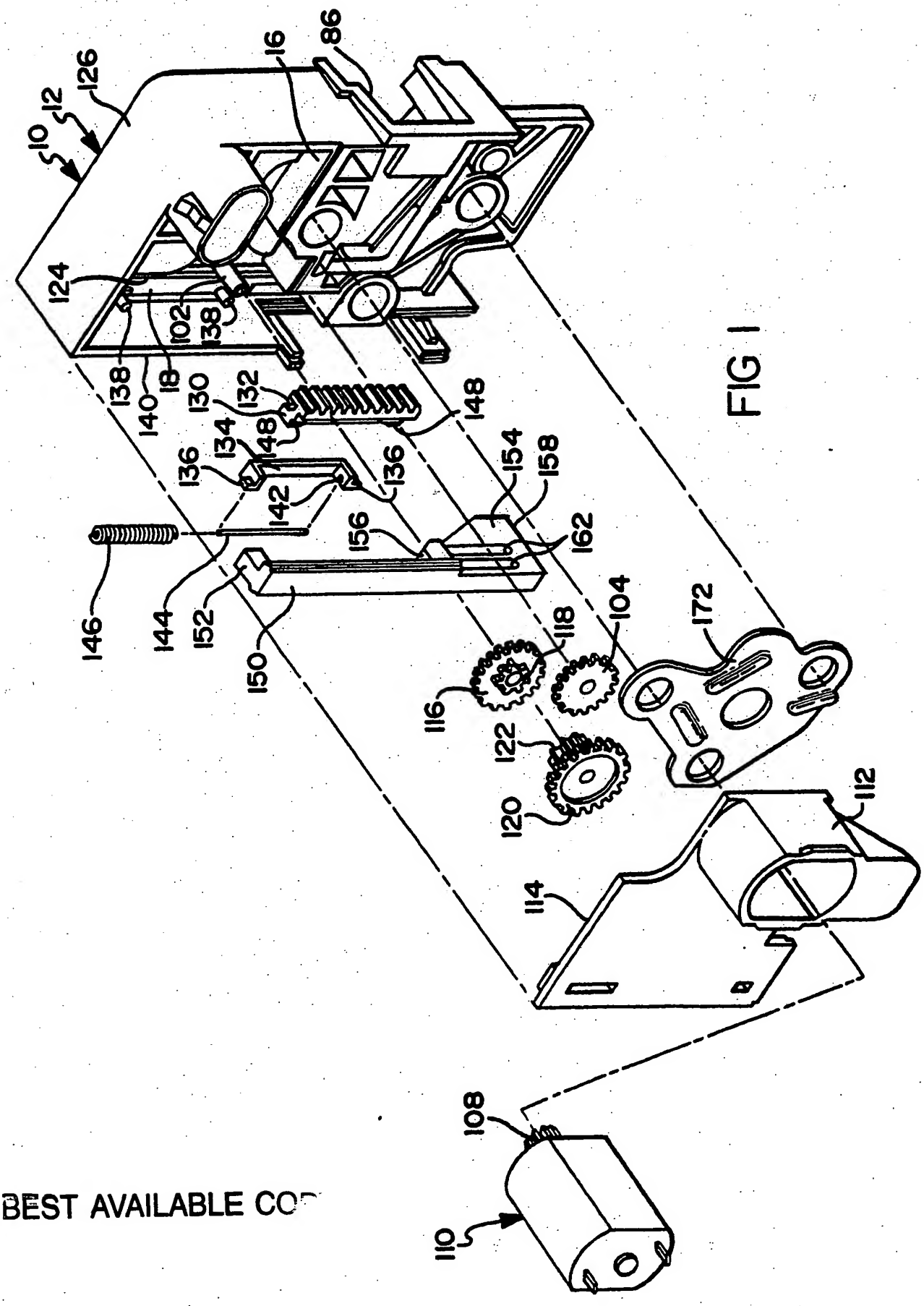

FIG 1

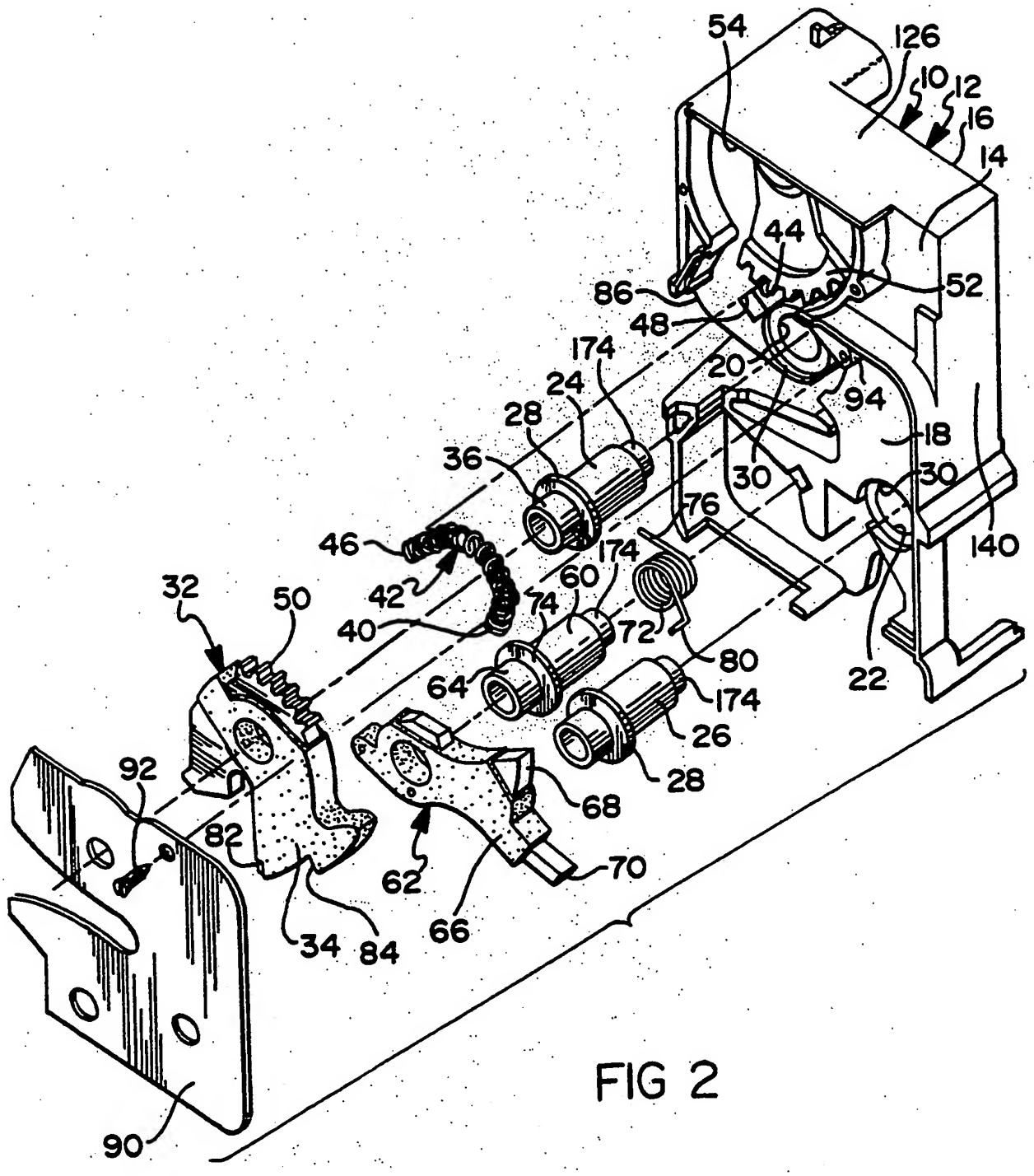

FIG 2

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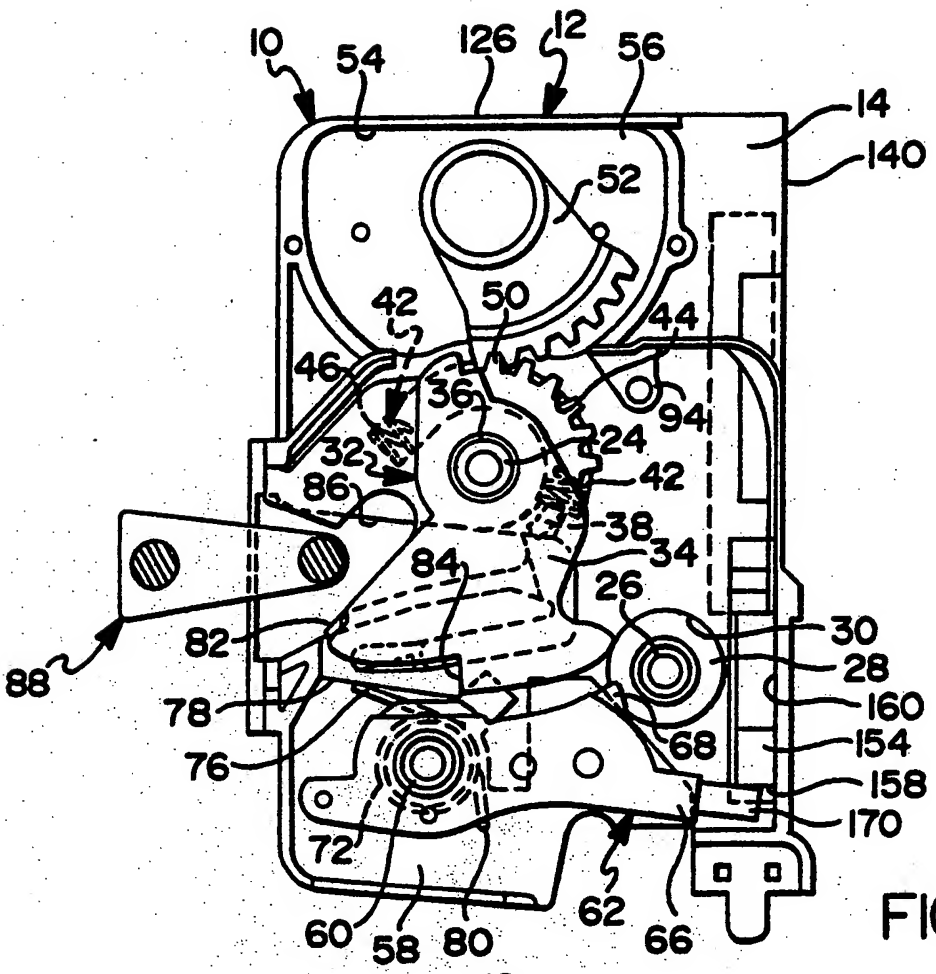

FIG 3

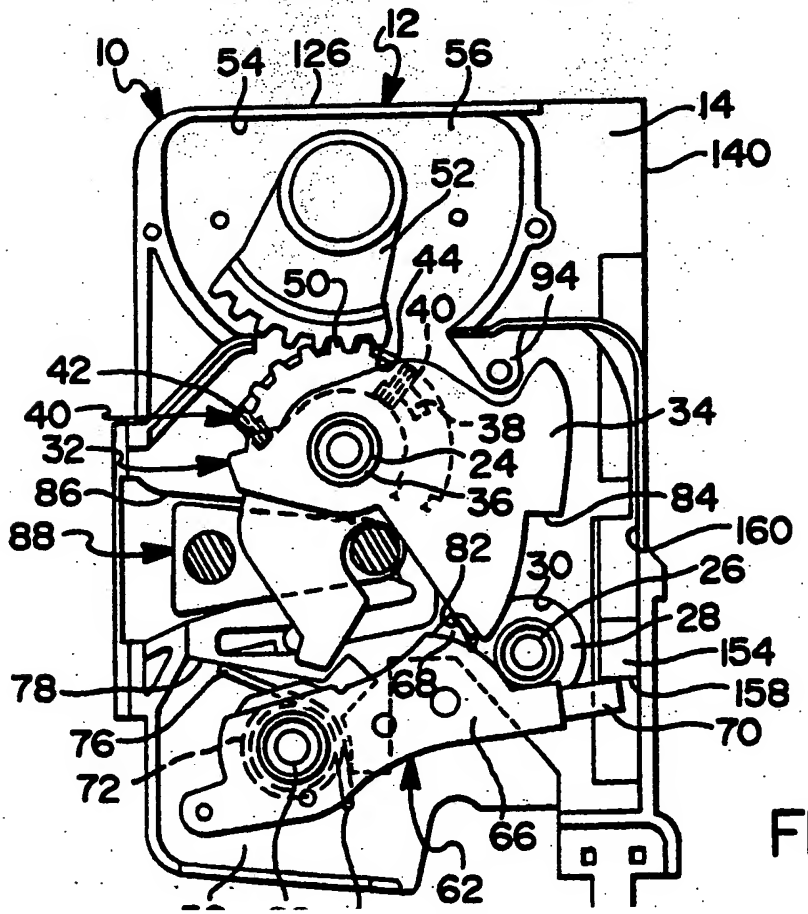

FIG 4

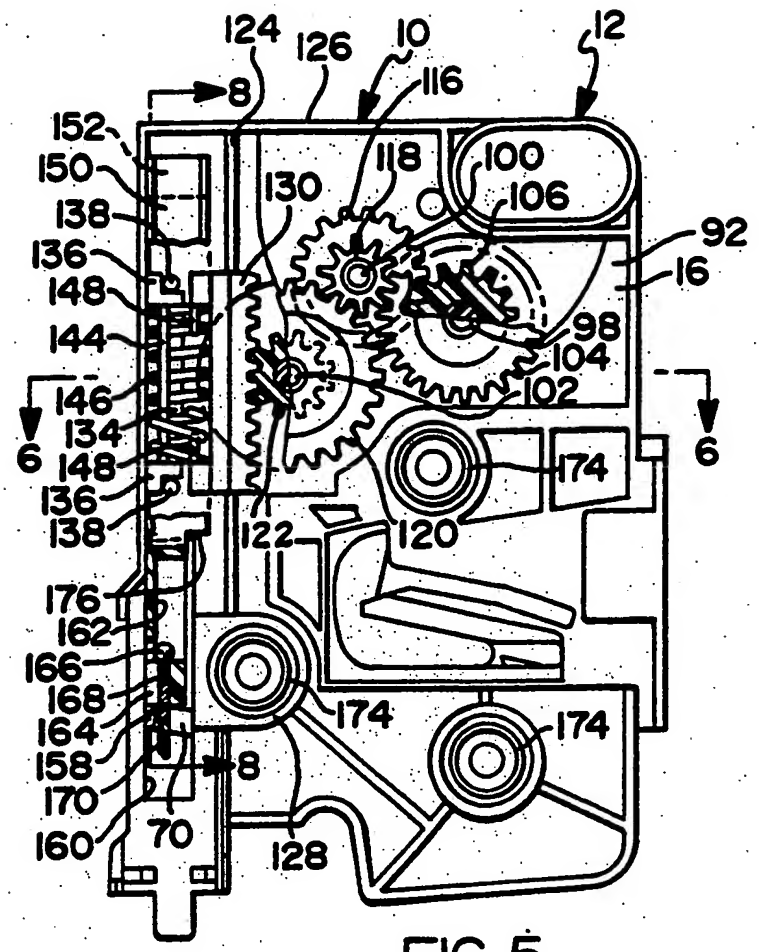

FIG 5

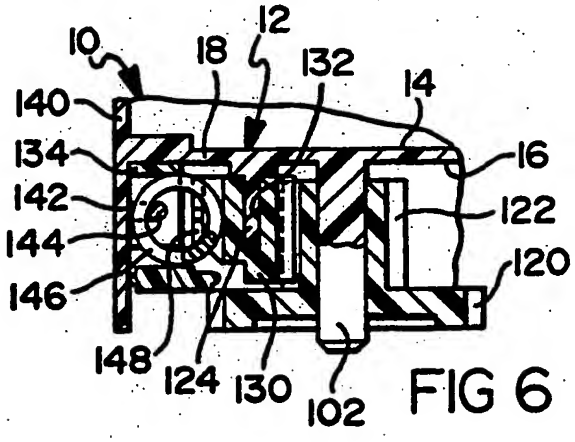

FIG 6

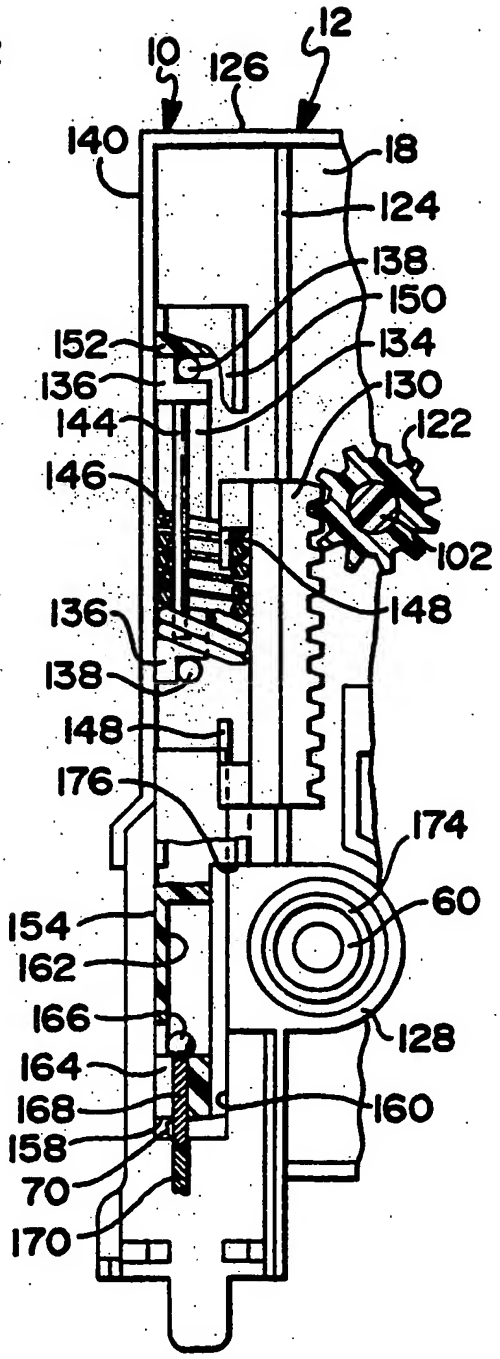

FIG 7

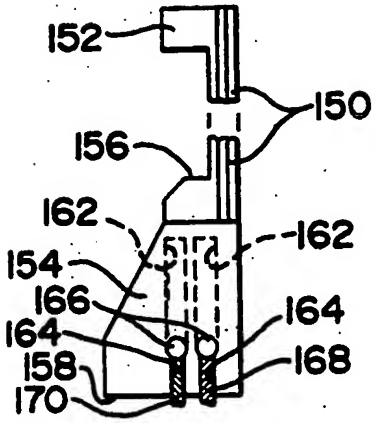

FIG 8

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CLOSURE LATCH

This invention relates generally to closure latches and more particularly to an improved actuating means controlling movement of a latch bolt to unlatched position.

The subject matter of this application is related to that of our copending application no. _____, (MJD/3142), filed the same day as the present application and our copending application publication no. 2193751A.

A closure latch in accordance with the present invention is characterised by the features specified in the characterising portion of Claim 1.

The closure latch of this invention includes a latch bolt which is movable between latched and unlatched positions, and a latch operator movable between detented and undetented positions with respect to the latch bolt. The latch operator is resiliently biased to detented position wherein it maintains the latch bolt in the latched position against the bias of resilient means which biases the latch bolt to unlatched position. The actuating means of this invention controls the movement of the latch operator between detented and undetented positions. The actuating means can (1) directly control the latch operator; or, (2) control other levers of the closure latch, such as an operating lever, which in turn controls the latch operator; or (3) control the locking means of the closure latch, such as the locking lever which places the closure latch in locked or unlocked condition.

In the preferred embodiment of the invention, the actuating means includes a reciprocable rack driven by a driver or passenger controlled electric motor or power operator through a

gear train. The rack is guided for linear movement relative to the latch frame and is normally located in a neutral position by resilient centring means. When the rack is driven by the power operator and gear train to a driving position, it concurrently drives an actuator from a neutral position to an operating position wherein the actuator (1) is directly coupled to move the latch operator to undetented position; or (2) is indirectly coupled to the latch operator through an operating lever which moves the detent to undetented position; or, (3) moves the locking lever of the closure latch to locked or unlocked position.

When the actuator reaches the operating position, the actuator is positively stopped to stall the electric motor or power operator. When the power is removed from the stalled electric motor or power operator by the driver or passenger releasing a switch, the bias of the resilient centring means returns the rack to its initial neutral or starting position and back drives the electric motor through the gear train.

The primary feature of this invention is to provide an improved actuating means for releasing a latch operator from detented engagement with a latch bolt to permit movement of the latch bolt from a latched position to an unlatched position. Another feature is that the actuating means includes an actuator which is power driven between neutral and operating positions and is (1) directly coupled to the latch operator to move the detent to undetented position; or (2) is indirectly coupled to the latch operator through intervening levers; or (3) is coupled to the locking means of the closure latch. A further feature is that the actuator is driven by the

power operator through an intervening rack which is normally resiliently centred in a neutral position and is moved to a driving position against the bias of the resilient centring means. Yet another feature is that the actuator moves to the operating position concurrently with movement of the rack to driving position. Yet another feature is that the actuator is positively stopped in the operating position to stall the power operator as the latch operator moves to undetented position. Still another feature is that the resilient centring means returns the rack to its neutral position and back drives the power operator when the power is removed from the power operator.

The present invention will now be described, by way of example, with reference to the following specification, and the accompanying drawings, wherein:-

Figure 1 is a blown apart perspective view of a closure latch in accordance with the present invention showing the actuating means;

Figure 2 is a blown apart perspective view of the closure latch of Figure 1 showing the latch bolt and apertured detent;

Figure 3 is a view showing the latch bolt and apertured detent of the closure latch in unlatched position;

Figure 4 is a view similar to Figure 3 showing the latch bolt and apertured detent in latched position;

Figure 5 is a view showing the actuating means when the latch bolt is in latched position;

Figure 6 is an enlarged view taken along line 6-6 of Figure 5;

Figure 7 is a view similar to Figure 5 and

showing the rack and actuator in their respective driving and operating positions; and

Figure 8 is a view taken generally along line 8-8 of Figure 5.

Referring now particularly to Figures 2, 3, and 4 of the drawings, a closure latch designated generally 10 includes a latch frame 12 of moulded plastic material. The latch frame 12 has one open side 14 thereof facing a latch pillar end wall of a vehicle door, not shown, on which the closure latch 10 is mounted, and the other open side 16 thereof facing the opposite or hinge pillar end wall of the vehicle door.

The one open side 14 of latch frame 12 includes a recessed wall 18 which is provided with through apertures 20 and 22 which respectively receive like hollow studs 24 and 26. Each of these hollow studs 24, 26 includes a flange 28, with these flanges being received in recesses 30 which surround the through apertures 20, 22 in recessed wall 18. A latch bolt 32, which is partially plastic covered, as indicated at 34, is rotatably mounted on one end 36 of hollow stud 24. The latch bolt 32 includes an extending abutment 38, Figures 3 and 4, which engages one end 40, Figure 2, of a coil compression spring 42. Coil compression spring 42 is housed in a recess 44 of recessed wall 18. The other end 46, Figure 2, of the coil compression spring 42 engages an end wall 48 of the recess 44. Coil compression spring 42 biases the latch bolt 32 clockwise as viewed in Figures 3 and 4 from its full latched position shown in Figure 4 to its unlatched position shown in Figure 3.

The latch bolt 32 includes a partially toothed periphery 50 which meshes with a sector 52

rotatably mounted in a recess 54 of the latch frame 12. Mounted within the recess 54 underneath a cover 56 is a switch arrangement which is shown in detail in our copending application no. _____ (MJD/3142). Since the details of the switch arrangement and its associated circuitry are not necessary to an understanding of this invention, they are not disclosed herein.

The latch frame 12 includes a further recessed wall 58 which is through apertured to receive a stud 60 which is the same as the hollow studs 24 and 26. An apertured detent (latch operator) 62 is rotatably mounted on an end 64 of stud 60. The apertured detent 62 is partially plastic coated as indicated at 66, Figure 2, and includes a detent shoulder 68 which is not plastic coated and a detent extension or arm 70 which is likewise not plastic coated. A coil torsion spring 72 surrounds the stud 60 between a flange 74 of the stud and the recessed wall 58. One leg 76 of the coil torsion spring 72 engages a wall 78 between recessed walls 58 and 18 and the other leg 80 of the coil torsion spring 72 engages the apertured detent 62 to bias the apertured detent counterclockwise as viewed in Figures 3 and 4 so that the detent shoulder 68 engages either a shoulder 82 of the latch bolt 32 as shown in Figure 4 to hold the latch bolt in full latched position or a shoulder 84 of the latch bolt to hold the latch bolt in an intermediate latched position, not shown.

The latch frame 12 includes a generally V or U-shaped recess 86 which opens through the recessed wall 18 and receives a striker 88, Figures 3 and 4, which is mounted on a pillar of the vehicle body. The throat of latch bolt 32 engages the

leading leg of the striker 88 when the latch bolt is in either latched position to maintain the vehicle door on which the closure latch 10 is mounted in a closed and latched position. The details of the striker 88 are not shown herein and reference may be had to our copending application publication no. 2193751A for such details.

A cover 90, Figure 2, fits over recessed walls 18 and 58 and is secured in place by a screw 92 which is received within a tapped abutment 94 of the latch frame 12. When the closure latch 10 is mounted to the latch pillar end wall of a vehicle door, a series of bolts, not shown, extend through such end wall and through cover 90 and are threaded into internal threads of the hollow studs 24, 26 and 60 to mount the closure latch 10 to the vehicle door.

Referring now to Figures 1, 5, 6, 7 and 8 the actuating means controlling movement of the apertured detent 62 to undetented position will now be described. A wall 96 of the latch frame 12, which provides the base wall of the recess 54, includes three integral posts 98, 100 and 102. The post 98 rotatably mounts a unitary (large diameter) gear 104 and a (smaller diameter) pinion 106, Figure 5. The gear 104 is driven by the output gear 108, Figure 1, of a small electric motor 110 which is supported within a housing 112 of a back plate 114 which covers a portion of the other open side 16 of the latch frame 12. Back plate 114 is sonic welded at its edges to the periphery of latch frame 12.

Pinion 106 meshes with a (larger diameter) gear 116 which is unitary with a (smaller diameter) pinion 118, both being rotatably mounted on the post 100. Pinion 118 in turn meshes with a (larger diameter) gear 120 which is unitary with a (smaller

diameter pinion 122, both rotatably mounted on the post 102. All gears and pinions have helical teeth.

The latch frame 12 includes an integral rib 124 which is formed on recessed wall 18 and extends from an upper peripheral wall 126 of the latch frame to an apertured boss 128 which receives the stud 60 on the other open side 16. A rack (driven means) 130, best shown in Figure 1, includes a groove 132 which receives the rib 124 to slidably mount the rack on the latch frame 12 for vertical movement between a normal position as shown in Figure 5 and a driving position as shown in Figure 7, as will be further described. The rack 130 teeth mesh with the pinion 122 (which defines power operated driving means), Figures 5 and 6. The groove 132 is slightly larger than rib 124 to ensure free movement of the rack 130 along the rib. The rib 124 controls the distance between the teeth of rack 130 and the centre of post 102. Rib 124 and groove 132 define mounting means for the rack 130.

A U-shaped cassette or housing 134 includes tabs 136 on its upper and lower legs which force fit between integral tabs 138 of recessed wall 18 and a peripheral side wall 140 of the latch frame 12 to thereby mount the housing 134 to the latch frame. The housing 134 includes closed grooves 142, Figures 1 and 6, in the juxtaposed faces of its upper and lower legs which receive the ends of a pin 144. The pin 144 mounts a compression spring (resilient means) 146 which is compressed between the legs of housing 134. The pin 144 and the compression spring 146 are mounted to the housing 134 before the tabs 136 of the housing are force fitted between tabs 138 and peripheral side wall 140. As best shown in Figures 5, 6, and 7, the rack 130 includes oppositely

extending triangular shaped or pointed integral tangs 148 which are received within the ends of the compressed spring 146. The compression spring 146 resiliently locates the rack 130 in its neutral position as shown in Figures 5 and 6. Inasmuch as the compression spring 146 is compressed between the upper and lower legs of the housing 134, the compression spring bows slightly between its compressed ends and engages the rack 130 between the tangs 148 as shown in Figures 5 and 6. This applies a biasing force on rack 130 to the right as viewed in Figures 5 and 6 to hold the rack teeth against the teeth of the pinion 122 for tolerance take up purposes.

An actuator 150 includes upper and lower arms 152 and 154, Figures 1 and 8, which straddle the rack 130. The lower arm 154 includes an upper edge or shoulder 156 and a lower edge or shoulder (moving means) 158. As best shown in Figures 3, 4, 5 and 7, the lower arm 154 projects through the latch frame 12 from the other open side 16 thereof to the one open side 14 thereof through a vertical slot 160 immediately adjacent the peripheral side wall 140. The shoulder 158 of the lower arm 154 seats on the detent extension arm 70 of the apertured detent 62 as shown in Figure 4 while the shoulder 156 of lower arm 154 is located immediately adjacent the lower edge of the rack 130 as shown in Figure 5. Compression spring 146 and detent extension arm 70 thus locate the rack 130 and actuator 150 in their respective neutral positions.

As best shown in Figures 1, 5, 7 and 8, the lower arm 154 of the actuator 150 includes a pair of closed slots 162 in one side thereof which open through the lower arm at their lower ends to keyhole

slots 164 in the other side thereof. The keyhole slots 164 receive ball ends 166 of a pair of cables 168 and 170. These cables 168, 170 provide for manual movement of the actuator 150, as will be described. The cable 168 may be connected to the key cylinder of the vehicle door on which the closure latch 10 is mounted or to a remote manual operator in the vehicle trunk or elsewhere. The cable 170 is connected to the inside release operator of the vehicle door.

To complete the closure latch 10, a back plate 172, Figure 1, is mounted over ends 174, Figure 2, of the hollow studs 24, 26 and 60 and located underneath the back plate 114. The ends 174 of the studs are headed over the back plate 172 to secure it in place.

When the latch bolt 32 is in full latched position as shown in Figure 4 and the detent shoulder 68 is in engagement with the shoulder 82 of latch bolt 32 to maintain the latch bolt in this position, the shoulder 158 of the lower arm 154 of actuator 150 seats on the detent extension arm 70 to locate the actuator in neutral position. The rack 130 is located in its neutral position by interengagement of the tangs 148 with the ends of the compressed spring 146. The lower edge of the rack 130 is slightly spaced from the shoulder 156 of the lower arm 154 of the actuator 150. If the latch bolt 32 were in intermediate latched position, the actuator 150 and rack 130 would be located in their same neutral positions.

If it is now desired to release the latch bolt 32 for movement to unlatched position as shown in Figure 3 under the bias of the coil compression spring 42, the apertured detent 62 must be moved

clockwise from its Figure 4 position to its Figure 3 position against the bias of the coil torsion spring 72. In order to accomplish this, the electric motor 110 is powered by the driver or passenger to shift the rack 130 downwardly as viewed in Figure 5 to its driving position through the gear train which consists of gear 104 being driven by the output gear 108, the gear 116 being driven by pinion 106, gear 120 being driven by pinion 118, and pinion 122 driving the rack 130. As the rack 130 is moved downwardly to its driving position shown in Figure 7, it compresses the compression spring 146 concurrently as it shifts the actuator 150 downwardly from its neutral position to its operating position, as shown in Figure 7, by engagement of the lower leg (engaging means) of the rack 130 with shoulder 156. When the actuator 150 is shifted by the rack 130 downwardly to its operating position, it moves the apertured detent 62 to its undetented position as shown in Figure 3 by engagement of the shoulder 158 with detent extension arm 70. When the actuator 150 reaches the operating position, a shoulder 176 of the actuator engages the apertured boss 128, Figure 7, to positively stop the actuator and stall the electric motor 110. As soon as the driver or passenger releases the power from the electric motor 110, such as by releasing a switch, the biasing force of the compression spring 146 shifts the rack 130 upwardly from its driving position to its neutral position as shown in Figure 5. The electric motor 110 is back driven through the aforenoted gear train during this movement of the rack 130 from the driving position to the neutral position. The shoulder 158 of actuator 150 remains seated on the detent extension arm 70 of the apertured detent 62 during movement of the rack 130

from driving position to neutral position.

Thereafter when the latch bolt 32 moves from the unlatched to the fully latched position as shown in Figure 4, the movement of the apertured detent 62 from the undetented to the detent position shifts the actuator 150 upwardly so that the shoulder 156 of the lower arm 154 is again located immediately adjacent the lower edge of the rack 130.

Although this invention has been described with the actuator 150 being directly coupled to the apertured detent 62 through the engagement of shoulder 158 with the detent extension arm 70 of the apertured detent, the actuator 150 may be indirectly coupled to the apertured detent to move the apertured detent to undetented position through one or more intermediate operating levers which are commonly used in vehicle closure latches. The actuator 150 could also be directly coupled to a locking means of the closure latch 10, such as a locking lever, to move the locking means between locked and unlocked positions and thus control movement of the latch bolt 32 to unlatched position by placing the closure latch in either locked or unlocked condition.

If the actuator 150 is directly coupled to a locking lever, the electric motor 110 must be bi-directional since rack 130 must move downwardly as previously described, to move the actuator to a first operating position and concurrently move the locking lever to one of its position. The rack 130 must also move upwardly to concurrently move the actuator 150 from the first operating position to a second operating position by engagement of the upper edge of the rack with the upper arm 152 of the actuator. Locking levers are conventionally located in either locked or unlocked position by the action of an

overcentre spring. Thus, once the power is released from the electric motor 110, the actuator 150 would be held in either its first or its second operating position by the overcentre spring of the locking lever. Additionally, if the locking lever is coupled to a manual operator, such as a key cylinder or other outside operator or an inside release handle or knob, operation of such manual operator would move the actuator 150 from one operating position to the other operating position concurrently with movement of the locking lever from one of its positions to the other of its positions. The actuator 150 would not have a neutral position if directly coupled to a locking lever and the spacing of shoulder 156 and upper arm 152 relative to the upper and lower edges of the rack 130 would have to permit independent movement of the actuator by the locking lever while the rack remains stationary in its neutral position. Thus, although the apertured detent 62 provides one type of latch operator which controls movement of the latch bolt 32 to unlatched position, the actuating means of this invention may be used with other types of latch operators.

Should for any reason manual release of the latch bolt 32 be required, actuation of either the inside release operator, not shown, or the outside key cylinder, not shown, will shift either cable 168 or 170 downwardly as viewed in Figures 5 and 8 to in turn shift the actuator 150 downwardly to its operating position, as previously described, to release the apertured detent 62 in the same manner as described. Upon movement of the apertured detent 62 to its detented position, as previously described, the actuator 150 will again be shifted upwardly to neutral position to locate the shoulder 156 thereof

immediately adjacent the lower edge of the rack 130. Rack 130 remains stationary during manual release of latch bolt 32.

Thus this invention provides an improved actuating means controlling movement of a latch bolt of a closure latch between latched and unlatched positions.

Claims

1. A closure latch comprising, in combination, a latch frame; a latch bolt mounted on the latch frame for movement between latched and unlatched positions; a latch operator movable to a latch bolt release position to control movement of the latch bolt to unlatched position; and actuating means controlling the latch operator; characterised in that the actuating means comprises an actuator mounted on the latch frame for movement between neutral and operating positions; moving means on the actuator for moving the latch operator to release position concurrently with movement of the actuator to operating position; driven means; mounting means mounting the driven means on the latch frame for movement between neutral and driving positions; resilient means locating the driven means in the neutral position and resisting movement thereof to the driving position; power operated driving means engageable with the driven means for moving the driven means from the neutral position to a driving position; and engaging means on the driven means engageable with the actuator for moving the actuator to an operating position upon movement of the driven means to the driving position; the resilient means returning the driven means to the neutral position upon cessation of operation of the power operated driving means to return the actuator to its neutral position.

2. A closure latch as claimed in Claim 1, wherein the latch bolt and the latch operator are mounted on one side of the latch frame; wherein the actuator is mounted on the other side of the latch frame; wherein the moving means on the actuator

extends to the one side of the latch frame for engagement with the latch operator; and wherein the mounting means mounts the driven means on the other side of the latch frame.

3. A closure latch as claimed in Claim 1 or Claim 2, wherein the driven means comprises a rack; wherein the mounting means permits linear movement of the rack; and wherein the power operated driving means comprises a pinion engageable with the rack.

4. A closure latch substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.